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Unconfined isotropic turbulence in time-decay GAETANO SARDINA, PAOLO GUALTIERI, CARLO MASSIMO CASCIOLA, Univ Rome La Sapienza — Homogeneous isotropic turbulence in time decay has been a paradigm in turbulence. Since the first experiments it appeared that scaling laws characterize the time decay. It was found that the turbulent kinetic energy introduced in the system with various forcing techniques decreases in time as a power law with exponent n. From experiments it appeared that the values of n are sensitive to the forcing and to the geometry of the apparatus. There are been a number of attempts to understand this dispersion of data, under the assumption that the value of n should be universal. We introduce a new numerical methodology to follow the time decay of homogeneous isotropic turbulence free from confinement effects. In these conditions we find that a universal scaling exponent emerges, $n = 1$, consistent with previous predictions based on suitable closure assumptions. It follows that the Taylor-Reynolds number is constant in time and the process of decay essentially amounts to an increase of scales according to $L = L_0 t^{1/2}$. Resort to standard simulation techniques in bounded domains allows to understand the confinement effects which alters the scaling exponent of the decay, giving rise to the scatter in the experimental data.

Gaetano Sardina
Univ of Rome La Sapienza

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